

WHAT IS CLAIMED IS:

1. A composite matrix comprising a first layer having at least about 5 dry weight percent flexibility modifying agent and a second layer having at least about 5 dry weight percent less flexibility modifying agent than the first layer, wherein at least one layer comprises a reconstituted composition.
2. The composite matrix of claim 1 wherein the second layer has at least about 60 dry weight percent collagen.
3. The composite matrix of claim 1 wherein the second layer has at least about 85 dry weight percent collagen.
4. The composite matrix of claim 1 wherein the second layer comprises crosslinked collagen.
5. The composite matrix of claim 1 wherein the second layer comprises intestinal collagen.
6. The composite matrix of claim 1 wherein the flexibility modifying agent comprises flexibility modifying bio-macromolecules.
7. The composite matrix of claim 6 wherein the flexibility modifying bio-macromolecules comprise an elastic protein.

8. The composite matrix of claim 7 wherein the elastic protein comprises elastin.
9. The composite matrix of claim 1 wherein the first layer has from about 5 to about 95 dry weight percent flexibility modifying agent.
10. The composite matrix of claim 1 wherein the first layer comprises at least about 5 dry weight percent collagen.
11. The composite matrix of claim 1 wherein the flexibility modifying agent comprises friction reducing macromolecules.
12. The composite matrix of claim 11 wherein the friction reducing macromolecules comprise proteoglycans.
13. The composite matrix of claim 11 wherein the friction reducing macromolecules comprise chondroitin sulfate, hyaluronic acid, derivatives thereof or mixtures thereof.
14. The composite matrix of claim 11 wherein the first layer comprises from about 25 to about 90 dry weight percent friction reducing macromolecules.
15. The composite matrix of claim 11 wherein the first layer comprises from about 10 dry weight percent collagen to about 75 dry weight percent collagen.

16. The composite matrix of claim 1 wherein the flexibility modifying agent comprises elastic proteins and friction reducing macromolecules.
17. The composite matrix of claim 1 wherein the second layer has a thickness of at least about 25 microns.
18. The composite matrix of claim 1 wherein the first layer has a thickness of at least about 25 microns.
19. The composite matrix of claim 1 wherein the first layer and the second layer each have a thickness from about 75 microns to about 1 millimeter.
20. The composite matrix of claim 1 wherein the first layer is crosslinked.
21. The composite matrix of claim 1 wherein the first layer is adjacent the second layer.
22. The composite matrix of claim 1 further comprising a third layer having at least about 60 dry weight percent collagen wherein the first layer is between the second layer and the third layer.
23. The composite matrix of claim 22 wherein the first layer comprises viable cells.

24. The composite matrix of claim 1 wherein the second layer is folded over a central core of the first layer.
25. The composite matrix of claim 1 wherein the second layer comprises growth factors.
26. The composite matrix of claim 1 wherein the second layer comprises attachment compounds for fibroblast precursor cells or for vascular endothelial precursor cells.
27. The composite matrix of claim 1 further comprising viable cells.
28. The composite matrix of claim 1 wherein the flexibility modifying agent comprises a synthetic polymer.
29. A valved prosthesis comprising a wall and a plurality of flexible leaflets supported by the wall, the wall comprising a composite matrix having a first layer with at least about 60 dry weight percent collagen and a second layer with at least about 25 dry weight percent collagen and at least about 5 dry weight percent elastin, and the leaflets comprising a composite matrix having a first layer with at least about 60 dry weight percent collagen and a second layer with at least about 25 dry weight percent collagen and at least about 5 dry weight percent proteoglycans.
30. The valved prosthesis of claim 29 wherein the valved prosthesis is a heart valve.
31. The valved prosthesis of claim 30 further comprising chordae.

32. The valved prosthesis of claim 29 wherein the plurality of leaflets is three leaflets.
33. The valved prosthesis of claim 29 wherein the valved prosthesis is a vascular graft.
34. The valved prosthesis of claim 29 further comprising a stent connected to the wall.
35. The valved prosthesis of claim 29 further comprising growth factors.
36. A method of forming a composite matrix, the method comprising fastening a first layer with a second layer, the first layer comprising at least about 25 weight percent collagen and the second layer comprising a flexibility modifying agent.
37. The method of claim 36 wherein fastening the first layer and the second layer comprises applying an adhesive at the interface between the first layer and the second layer.
38. The method of claim 36 wherein the fastening the first layer and the second layer and the second layer comprises applying pressure.
39. The method of claim 36 wherein the fastening the first layer and the second layer and the second layer comprises applying heat.
40. The method of claim 36 wherein the fastening the first layer and the second layer and the second layer comprises chemical crosslinking.